TALLAHASSEE AREA
MINIMUM TEMPERATURE STUDY

Monthly Report-April 2002

National Weather Service-Tallahassee
Department of Meteorology, Florida State University

Introduction

This is the fifth monthly report describing minimum temperatures in the Tallahassee area. It is part of a long term joint research project between the National Weather Service, Tallahassee and the Florida State University Department of Meteorology.

April 2002

This month's balmy 59.9 degree average minimum temperature at the Tallahassee Regional Airport was the warmest April on record. The 30 year average April minimum at the airport is 53.2 degrees. This was a very dry month, with the only significant rain, 0.36 inches, occurring on the 12th. The absence of frontal passages was largely responsible for the lack of cold days. A record twenty-three observers participated in the study, and their locations are indicated on the attached map (Fig. 1). The observer locations represent a wide spatial distribution across Leon County.

1. TALLAHASSEE AREA APRIL 2002 REVIEW

Table 1 gives daily minimum temperatures as well as means and standard deviations for each location in the network. These data can be used to compare any site with the other twenty-two. The coolest readings at the airport occurred on April 5th-7th, with the mildest readings on the 28th-30th, and to a lesser extent, the 17th-22nd. A cold front crossed the area on the 3rd, followed by veering and increasing winds to northwest, clear skies, unlimited visibilities and a drop of 12 degrees. This produced the coolest temperatures of the month several days later. Conversely, persistent sultry, onshore winds dominated the second half of the month combined with the complete absence of cold fronts. Fog and low ceilings were reported almost every night, with dense fog occurring on about half these days. This led to greatly reduced radiational cooling and unseasonably warm minimums, culminating in the last two days of the month when lows were almost 70 degrees.

On the coolest days of the month, the range of minimums across the Tallahassee area was 13 to 14 degrees. As expected with April's unseasonably mild temperatures, the maximum range was considerably less than experienced during the previous four winter season months. However, it remains significant for a small city like Tallahassee. As in previous months, the range was greatest two nights after the frontal passage when

radiational cooling was greatest. Conversely, during the mildest nights, the ranges were generally 5 to 7 degrees.

2. APRIL 2002 MINIMUM TEMPERATURE EVALUATION

Figure 2 is a station histogram which shows how each site ranks in comparison to the other twenty-two sites during April 2002.

Table 2, labeled “Frequency of Extremes” demonstrates another way to view the data. It is more informative than simple raw data or rank histograms, telling how many times (and the percentage of times) that your station ranked as one of the coldest or warmest four sites on a particular day.

a) Coldest and warmest sites

Four of the five coldest sites during April also were the coldest during the previous months. These are (in order) Chiles, Canopy, Lundy, McCool and Binkley. Chiles replaced Oak Ridge which was the sixth coldest. Likewise, four of the five warmest sites this month were the same as those during the previous months. These include (in order) Brogan, Winsberg, FSU, Wakulla and Bellenot. Winsberg and FSU, (the latter a new observer replacing Stuart), are both located near downtown, and recorded minimums similar to Brogan, the downtown site. This substantiates the significant ranges between the downtown area and the more rural suburbs. In fact, all the warmest sites except Wakulla are closest to the downtown area. The monthly consistency in the spatial distribution of cold and warm sites validates the data presented.

b) Topography, natural surfaces and soil type

The results continue to show relatively large temperature variations associated with the Tallahassee urban heat island, even during periods of mild weather. Not surprisingly, the five coldest sites are located far from downtown in the most rural parts of the county where natural surfaces dominate. Two are in the northwest, one in the north, one in the south, and one in the southwest quadrants. Topography likely influences the temperature distribution. These coldest sites are all situated west of the Thomasville-Meridian-Monroe roads that divide the county in half, with the western half relatively hilly and the eastern half relatively flat. Soil type also may factor into the temperature distribution. North of Tennessee Street, the prevailing soil type is clay, while sand predominates to the south. These deep sands are more effective emitters of radiation which translates to lower nighttime minimums, especially when augmented by the absence of surrounding trees and vegetation. This may contribute to the abundance of cold sites across the southern half of Leon County.

c) Wind speed and direction

The April data continue to validate classical urban heat island studies which indicate that minimum temperatures decrease as you move away from the city center. Perhaps of greater interest is the spatial distribution of cold sites during and after a frontal passage. During a passage and the day after, when northwest and north wind speeds are strongest, locations in the northwest through northeast quadrants, not normally cold spots, rank among the coldest for that day. These include WCTV (310 feet), Lanier (160 feet) and Fiorino (85 feet). All three sites are located on the north or windward facing slopes and, in two cases, on some of the counties highest elevations. Conversely, the most southern sites, i.e., McCool, are generally not among the coldest. However two days later, when winds typically diminish and radiational cooling dominates, the distribution of coldest sites becomes more evenly distributed (see above). The distribution is no longer based largely on wind speed and direction but more on distance from downtown, the amount of natural surface, topography and soil type.

d) The Tallahassee Airport (TLH)

During April, the Tallahassee airport was one of the warmest four sites 23 percent of the time, but one of the coldest only 13 percent of the time. Averaging the five month study period (December-April), it was one of the warmest sites 25 percent and coldest only 7 percent of the time. This continues to substantiate that, contrary to popular belief, the airport does not represent a cold valley in area temperatures. Minimum temperature forecasts for Leon County must address this issue.

Summary

This is the fifth month of Tallahassee minimum temperature data including all the winter season of 2001-2002, plus April, a record month for warm minimums and the initial month of spring. Although temperature ranges during April were less than during the previous four colder months, they still were significant for a city this size. The data continue to imply that the Tallahassee urban heat island is more complex, and the minimum temperature ranges are significantly more varied, than previously anticipated. Although temperatures generally decrease with distance from downtown, several factors can alter this circular distribution. In particular, the daily spatial distribution of coldest temperatures appears to be related to synoptic factors, including the effect of frontal and post-frontal weather as well as topography, soil and land use type. Future reports will investigate the reasons for these occurrences in more detail.